

S/N Unknown

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Gurtej Singh Sandhu et al.

Examiner: Unknown

Serial No.: Unknown

Group Art Unit: Unknown

Filed: Herewith

Docket: 303.676US5

Title: CHEMICAL VAPOR DEPOSITION OF TITANIUM

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

When the above-identified patent application is taken up for consideration, please amend the application as follows:

IN THE SPECIFICATION

Please make the paragraph substitutions indicated in the appendix entitled Clean Version of Amended Specification Paragraph. The specific changes incorporated in the substitute paragraph are shown in the following marked-up version of the original paragraph:

The paragraph beginning on page 1, line 4 is amended as follows:

This application is a Divisional of U.S. Application No. 09/489,187, filed on January 20, 2000, which is a continuation-in-part of U.S. Application Serial No. 09/030,705, filed February 25, 1998, now issued as U.S. Patent 6,143,362 on November 7, 2000, which is hereby incorporated by reference in its entirety.

IN THE CLAIMS

Please cancel claims 1-50 and 57-59 after adding the following new claims.

60. (New) A via, comprising:

a first layer of a titanium alloy within a contact opening in an insulating layer, wherein the titanium alloy comprises titanium and an element selected from the group consisting of zinc, cadmium, mercury, aluminum, gallium, indium, tin, silicon, germanium, lead, arsenic and antimony;

a second layer of titanium silicide coupled to the first layer; and

a fill coupled to the titanium alloy layer, wherein the fill comprises a metal selected from the group consisting of tungsten and aluminum.

61. (New) The via of claim 60, wherein the first layer includes a titanium zinc alloy.
62. (New) The via of claim 60, further including a titanium nitride layer interposed between the titanium alloy layer and the fill.
63. (New) The via of claim 60, wherein the first layer is coupled to a sidewall of the contact opening.
64. (New) The via of claim 60, wherein the second layer is coupled to an exposed semiconductor surface.
65. (New) The via of claim 60, wherein the contact opening includes a high aspect ratio contact opening.
66. (New) A via, comprising:
a first layer of a titanium alloy within a high aspect ratio contact opening in an insulating layer, wherein the titanium alloy comprises titanium and an element selected from the group consisting of zinc, cadmium, mercury, aluminum, gallium, indium, tin, silicon, germanium, lead, arsenic and antimony;
a second layer of titanium silicide coupled to the first layer; and
a fill coupled to the titanium alloy layer, wherein the fill comprises a metal selected from the group consisting of tungsten and aluminum.
67. (New) The via of claim 66, wherein the first layer includes a titanium zinc alloy.

68. (New) The via of claim 66, further including a titanium nitride layer interposed between the titanium alloy layer and the fill.
69. (New) The via of claim 66, wherein the insulating layer includes borophosphous silicate glass (BPSG).
70. (New) The via of claim 66, wherein the insulating layer includes silicon dioxide (SiO₂).
71. (New) The via of claim 66, wherein the first layer is coupled to a sidewall of the high aspect ratio contact opening.
72. (New) The via of claim 66, wherein the second layer is coupled to an exposed semiconductor surface.
73. (New) A via, comprising:
a first layer of a titanium alloy on a sidewall of a high aspect ratio contact opening in an insulating layer, wherein the titanium alloy comprises titanium and an element selected from the group consisting of zinc, cadmium, mercury, aluminum, gallium, indium, tin, silicon, germanium, lead, arsenic and antimony;
a second layer of titanium silicide formed overlying an exposed semiconductor base layer of the contact hole;
a fill coupled to the titanium alloy layer, wherein the fill comprises a metal selected from the group consisting of tungsten and aluminum.
74. (New) The via of claim 73, wherein the first layer includes a titanium zinc alloy.
75. (New) The via of claim 73, further including a titanium nitride layer interposed between the titanium alloy layer and the fill.

76. (New) The via of claim 73, wherein the insulating layer includes borophosphous silicate glass (BPSG).
77. (New) The via of claim 73, wherein the insulating layer includes silicon dioxide (SiO₂).
78. (New) A via, comprising:
a first layer of a titanium alloy within a contact opening in an insulating layer, wherein the first layer is produced using a method including:
forming a seed layer supported by a substrate by combining a first precursor with a first reducing agent;
forming the titanium layer supported by the substrate by combining a titanium-containing precursor with the seed layer; and
filling the remaining space of the contact opening with a metal selected from the group consisting of tungsten and aluminum.
79. (New) The via of claim 78, wherein the first layer titanium alloy includes titanium and an element selected from the group consisting of zinc, cadmium, mercury, aluminum, gallium, indium, tin, silicon, germanium, lead, arsenic and antimony.
80. (New) The via of claim 78, wherein the first layer titanium alloy includes titanium and zinc.
81. (New) The via of claim 78, further including a second layer of titanium silicide coupled to the titanium alloy.
82. (New) The via of claim 78, further including a titanium nitride layer interposed between the first layer and the fill.

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83. (New) The via of claim 81, further including a titanium nitride layer interposed between the second layer and the fill.
84. (New) The via of claim 78, wherein the first layer is coupled to a sidewall of the contact opening.
85. (New) The via of claim 78, wherein the first layer is coupled to a high aspect ratio contact opening.

REMARKS

Currently claims 51-56 and 60-85 are pending in the application. The Applicant respectfully requests that the preliminary amendment described herein be entered into the record prior to examination and consideration of the above-identified application. The Examiner is invited to contact Applicant's Representatives at the below-listed telephone number if there are any questions regarding this Preliminary Amendment or if prosecution of this application may be assisted thereby.

Respectfully submitted,

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This paper or fee is being deposited on the date indicated above with the United States Postal Service pursuant to 37 CFR 1.10, and is addressed to the Commissioner for Patents, Box Patent Application, Washington, D.C. 20231.

CLEAN VERSION OF AMENDED SPECIFICATION PARAGRAPHS

CHEMICAL VAPOR DEPOSITION OF TITANIUM

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The paragraph beginning on page 1, line 4.

This application is a Divisional of U.S. Application No. 09/489,187, filed on January 20, 2000, which is a continuation-in-part of U.S. Application Serial No. 09/030,705, filed February 25, 1998, now issued as U.S. Patent 6,143,362 on November 7, 2000, which is hereby incorporated by reference in its entirety.

U.S. Patent 6,143,362